# Freight Management System for Bengaluru

Dr. Sanjeeva Kumar B.H [1]

[1] **SLS Transport Training Institute and Consultancy**
Email for correspondence, e.g. sanjeev@tticblr.com

## 1 INTRODUCTION

Referred to as the "Garden City" and "The Silicon Valley of India," Bangalore is known as a technological center with the highest concentration of IT companies in India. The Bangalore Metropolitan Region (BMR) which comprises Bangalore Urban district, Bangalore Rural district and Ramanagara District. Since 2007, BMRDA covers an area of 8,005 km2 (3,091 sq mi), the second largest metropolitan area in India, after the Amaravati Metropolitan Region.

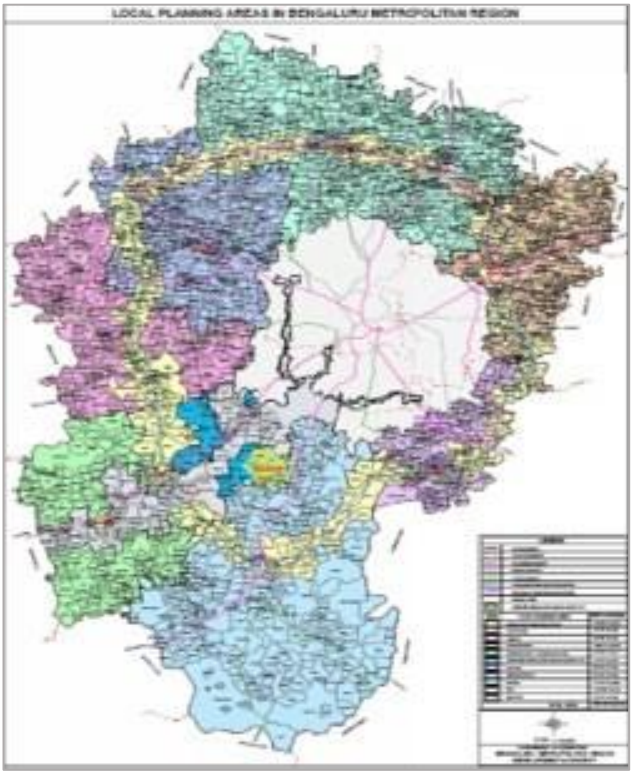


Figure 1. Map showing Bengaluru Metropolitan Region (BMR)

Bangalore has also emerged as India's fifth largest metropolitan city by population (also the third largest city proper by population). The city crossed a population of 12.5 million in 2022, while the number of vehicles registered as of 2022 was more than 11 million. Bengaluru's road network (around 14,000km) consists of ring roads, major roads (arterial, sub-arterial) and residential streets. They are managed by agencies like BBMP, BDA, PWD and KRDCL.

With nine radial corridors and a number of orbital roads, some of which are not continuous, there are a large number of intersections in the city. With the rapidly growing traffic, delays at junctions increase causing difficulty in controlling and regulating them. Bengaluru, has been ranked among the most traffic congested cities of the world, next only to London, with an increased travel time of nearly 29 minutes and 10 seconds to drive a distance of 10 km in the year 2022.

Traffic police who are in charge of enforcement also do the planning required for such regulation. Bengaluru City Traffic Branch has got 8 Sub-Divisions, 44 Traffic Police Stations. Each traffic sub-division is headed by an Assistant Commissioner of Police and Police Station by an Inspector of Police.

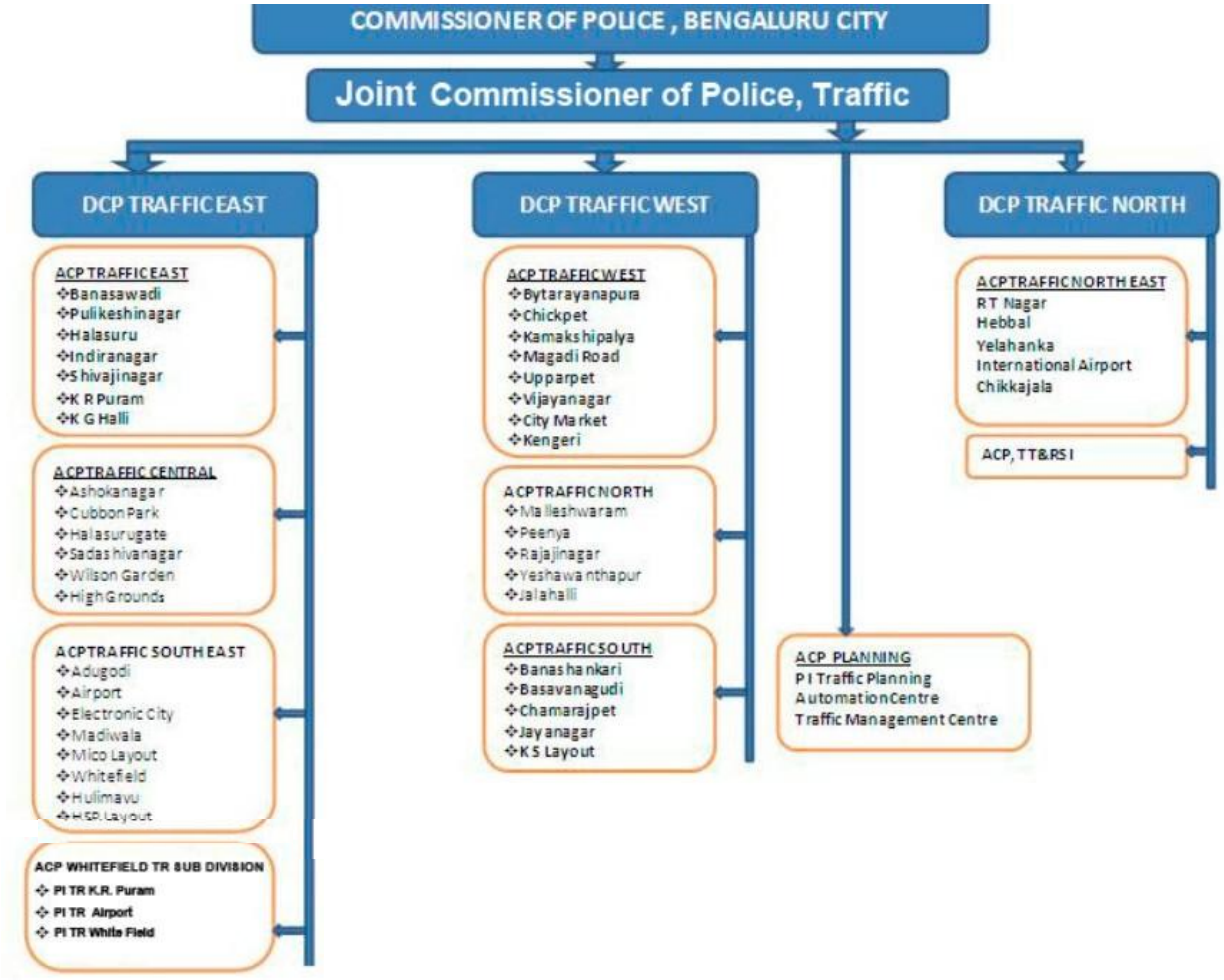


Figure 2. Diagram showing Hierarchy of Bengaluru Traffic Police

The Policy that the Traffic Police has been emphasizing has been a multi-layered approach:

i. Traffic Management - through regulations and restructure
ii. Traffic Infrastructure - in terms of grade separators and sub-ways
iii. Intelligent Transportation Systems (ITS) - use of Automated Traffic Control Systems
iv. Synchronised Signal Systems
v. Automated Enforcement - through PDAs

As is evident from the previous paragraphs, Bengaluru City has witnessed a phenomenal growth in population as well as vehicle population. As a result, many of the arterial roads and intersections are operating over the capacity (i.e., v/c is more than one) and average journey speeds on some of the roads in the Central Area are lesser than 15 kmph in the peak hours. Therefore, the State Government of Karnataka thought of a Mass Rapid Transit System way back in the year 1994 and the project took off in the name of Bengaluru Metro or *Namma Metro* as it is popularly known as, which began its operation in the year 2011 and at present operates to the length of about 70 km with a daily ridership of 0.7 million. Another 105 km of metro rail is under construction and by the year 2026, the average daily ridership will touch 1.7 million.


Figure 3. Bengaluru Metro Route Map

## 2 PROBLEM

Bengaluru today is obviously one of the most sought after cities in the country what with the rapid growth in the IT industry and the rise in the number of job opportunities in the city. With the rising population in the city there is also a corresponding increase in the number of vehicles in the city and a huge increase in the demand on land. Rapid population growth because of IT and other associated industries in Bengaluru led to an increase in the vehicular population to about 1.5 million, with an annual growth rate of 7-10%.

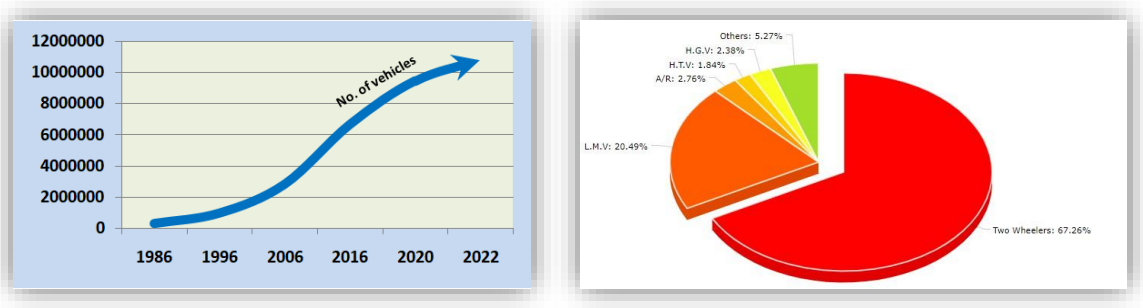


Figure 4. Growth of Vehicles and Vehicular Composition in Bengaluru City

With the increase in population and the expansion of the city, the problem of connectivity of the populace has arisen. Quite obviously personalized modes of transport have grown at a tremendous rate and two wheelers along with cars almost comprise 90% of the total registered vehicular population in the city. What adds to the traffic pressure in particular is that there is very little scope for expansion of roads and the need to use existing roads for smooth movement of vehicles is even more pronounced.

Since Metro network is yet to cover the entire city and lacks end mile connectivity, the number of two-wheelers and four wheelers have actually increased. The limited road space of Bengaluru is not able to handle the current traffic generated

by the ever burgeoning population. Consequently, traffic in Bengaluru has become a scourge and is only worsening day by day. Network speeds are dropping at an alarming rate as capacity of the Junctions and links have exceeded the limits. These have contributed towards increasing traffic congestion, travel times and pollution levels. The heavy freight movement is also a bane as it affects the already congested traffic loads of the city's road network. Bengaluru city has nearly 8 million private vehicles in the city as of 2022. The freight movement is associated with the following issues;

i. Increased volumes congest road networks
ii. Heavy trucks spew fumes & pollute the environs.
iii. Create parking issues.
iv. Increase in accidents.

The truck movement in and around Bangalore is captured in the figure below,

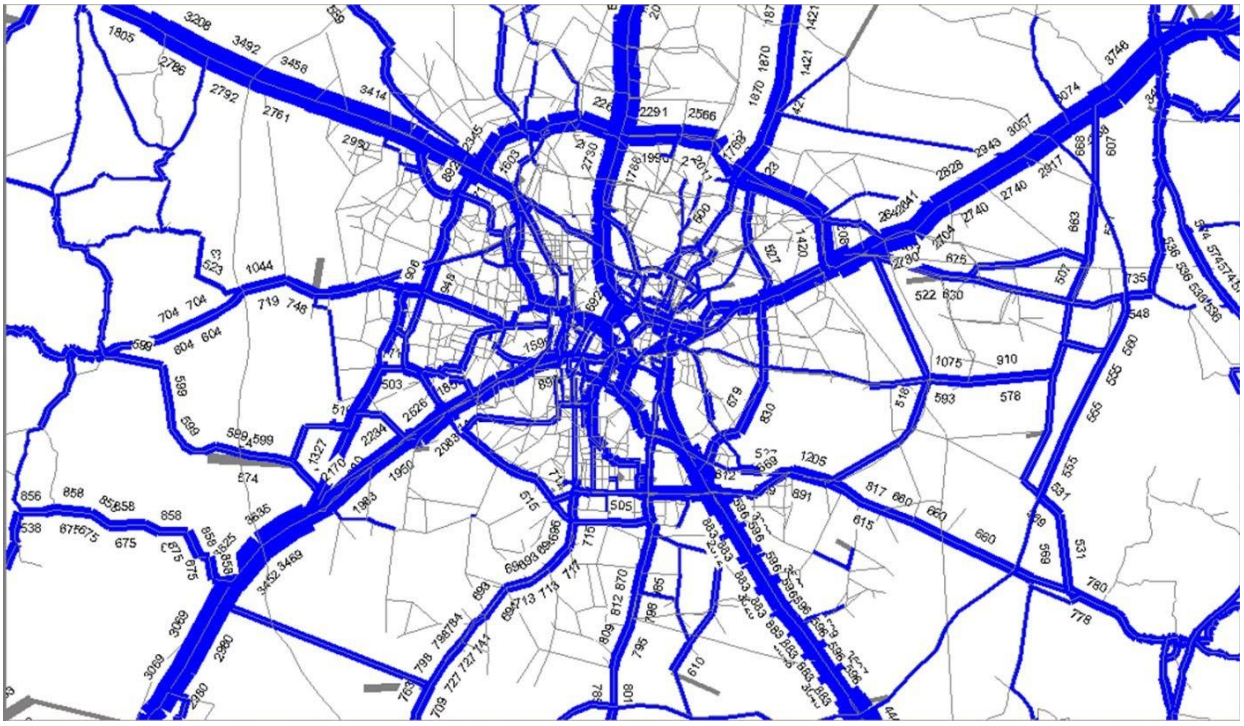

Figure 5. Road Network showing Truck Movement in and around Bangalore

Presently, trucks are restricted on 44 Arterial Roads, 148 Sub-arterial Roads and 220 Collector Streets.

It was observed that though the number of accidents via two wheeler is more, the rate of people being killed is more, the rate of people being killed is more in terms of heavy vehicles because of the occupancy factor each vehicle has.

| | Vehicle Class by Accident Severity | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Accident Severity | Vehicle Class | | | | | | | |
| | | Car | Two wheeler | Bus | Heavy Vehicle | Auto | Cycle | Other | Unknown |
| 2011 | Fatal | 85 | 195 | 59 | 123 | 21 | 12 | 22 | 27 |
| | Injury | 1424 | 2361 | 391 | 511 | 311 | 78 | 128 | 24 |
| | Damage | 287 | 38 | 35 | 65 | 6 | 0 | 14 | 2 |
| 2012 | Fatal | 80 | 222 | 73 | 127 | 12 | 8 | 23 | 36 |
| | Injury | 1233 | 2102 | 320 | 477 | 284 | 55 | 146 | 13 |
| | Damage | 261 | 44 | 26 | 52 | 14 | 0 | 16 | 1 |
| 2013 (up to October) | Fatal | 76 | 199 | 70 | 111 | 15 | 7 | 22 | 18 |
| | Injury | 1064 | 1631 | 276 | 325 | 223 | 37 | 124 | 9 |
| | Damage | 90 | 7 | 15 | 13 | 4 | 0 | 9 | 0 |

Figure 6. Road Accident Statistics for Bangalore

## 3 NEED

Traffic congestion cannot be eliminated in a city like Bengaluru and it probably shouldn't be. The focus should not be on creating more space—that will only induce people to buy more private vehicles. It should, instead, be on configuring systems to move the existing population more efficiently. Transportation is an urban planning problem and its solution must have an integrated approach.

Some of the effective decongestive approaches are,

i. Effective traffic management
ii. To decongest CBD areas
iii. To organize freight management
iv. To ease movement of private and public mode of transport on Arterial Roads
v. To enhance the safety and prevent Road Traffic Crash

As discussed in the earlier paragraph, freight management gains importance.

## 4 BEST PRACTICES

Cities in the world are different, so are their freight transport and logistics activities. Freight follows local economic, geographic and cultural specificities. Chicago concerned with maintaining its role as a rail hub –focus on rail freight movements. Los Angeles concerned primarily with air pollution and targets urban trucking. In large cities of poor countries, focus is on bridging the gap between increasing urbanization and supply of infrastructure. The easiest tool available to cities confronted with freight activities is truck access restriction, based on various criteria (used alone or combined):

a) time windows
b) weight (total or per axle)
c) size (length, height, surface)
d) noise emission
e) air pollution
f) Loading factor
g) type of goods (hazardous, voluminous, living animals)

The most famous truck ban in Europe is the London Lorry Ban, in place since 1975. Paris has banned trucks during day time. Tokyo, many geographical areas are not accessible to trucks over 3 tons. Truck bans are also in place in many U.S cities. Seoul has banned trucks in the central areas during working hours. In Sao Paulo, access is based on the plate number, with two days allowed per vehicle (including freight vehicles).

Restricting large trucks in cities has been one of the most popular measures in developing countries, due to road limitations. The policy adopted in Manila is trucks with a gross weight of more than 4.5 tons cannot travel along eleven primary arterial roads from 6 in the morning until 9 in the evening. It is common in large Chinese cities to ban trucks above five tons from the city centre during peak hours. The objective is to concentrate goods distribution during the night.

As case studies freight management practices in Portland and Seoul were considered,

### CASE STUDY 1 – PORTLAND CITY

Portland recognized the need to have better freight transportation by understanding deficiencies and developing solutions. Some of the important aspects focused in the plan include evaluation of freight transportation policies, identification of freight mobility improvements and development of freight mobility projects in alignment with the people's needs in the city of Portland.

### CASE STUDY 2 – SEOUL METROPOLITAN CITY

In Seoul, truck traffic at the major expressway and the arterial roads accounted for 20 per cent of the total road vehicle traffic. Trucks were plying onto the arterial roads causing several traffic jams and inefficiencies. In 1998 the Seoul Metropolitan City undertook a large-scale research project to work out an improvement plan for urban goods by collecting urban freight movement within and around the city.

Based on the research project, the metropolitan authority adopted the urban goods transport plan and even constructed new freight distribution facilities that improved truck operations and allowed the dual usage of roads by passenger cars and trucks. Further, there was also a provision of on-road and off-road loading facilities for trucks. Enforcement is undertaken by special "Enforcement Motor Squads for enforcing the restriction of trucks".

OVERVIEW OF FREIGHT TRANSPORT IN INDIA

In India, the relative share of rail in total freight traffic declined from 86.2% in 1960-61 to 63.5% in 1980-81 while the share of road increased from 13.8% to 36.5% over the same period. The 1980s saw significant growth in the freight traffic for both modes and their relative shares were quite stable. The maximum shift occurred in the 1990s when the share of rail declined from 62.6% at the beginning of the decade to 39.0% at the end, while that of road increased from 37.4% to 61.0%. This trend continued during the next decade and the gap between the two modes has continued to widen. In 2007-08, the relative share of rail and road in freight traffic movement was 33% and 67% respectively.

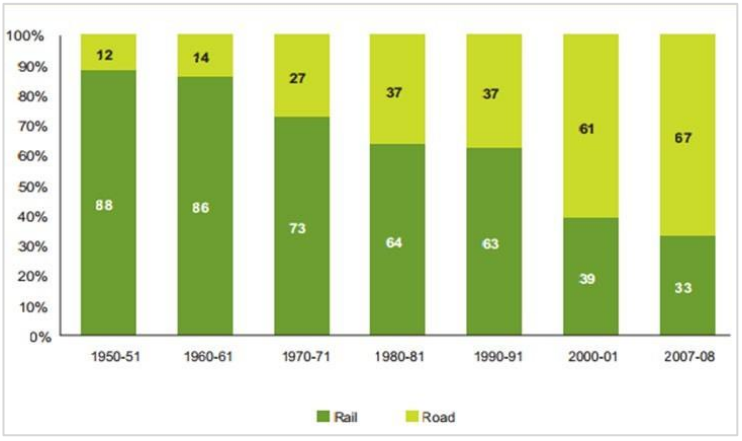


Figure 7. Freight Traffic Movement in India by rail and Road (1950-2010)

Road transport had the largest share in freight movement, accounting for 61% of total freight volume (measured in tons) and 50% of total freight traffic (measured in NTKM). In contrast to this, the share of railways was 30% of total freight volume. Coastal shipping and pipelines are also emerging as strong viable options in the sector, while the share of Inland waterways and Airways remain quite small. A possible explanation could be that road is perceived as a better option compared to rail in terms of level of service and service quality.

The following table shows different Freight Corridors in India.

| Dedicated Fright Corridor | Route | | Track gauge | Speed | Length (km) | Further Extension | Status |
|---|---|---|---|---|---|---|---|
| | Start Point | Termination Point | | | | | |
| Western Dedicated Freight Corridor | Dhari | JNPT, Nava Sheva | Broad Gauge | | 1483 | | Approved in Rail Budget 2014-15.[26] |
| Eastern Dedicated Freight Corridor | Ludhiana | Dankuni | Broad Gauge | | 1839 | | Approved in Rail Budget 2014-15.[27] World Bank has sanctioned loan for development of 393 kms of double track between Mughalsarai and Bhaupur (near Kanpur and between Kanpur and Etawah).[28] |
| East-West Dedicated Freight Corridor | Kolkata | Mumbai | Broad Gauge | | 2000 | | Planned |
| North-South Dedicated Freight Corridor | Delhi | Chennai | Broad Gauge | | 2173 | | Planned |
| East Coast Dedicated Freight Corridor | Kharagpur | Vijayawada | Broad Gauge | | 1100 | | Planned |
| South-West Dedicated Freight Corridor | Chennai | Goa | Broad Gauge | | 890 | branching to Mangalore from Bangalore | Planned |

Table 1. Freight Corridors in India

As a Case Study, freight management practised in Delhi is explained below,

CASE STUDY – DELHI

The Honourable Supreme Court of India in its order dated 6.12.2001 prohibited the entry of all non-destined heavy, medium or light goods vehicles into Delhi from all border entry points in order to improve air quality, reduce traffic congestion, enhance safety of road users. Restriction timing on plying of commercial goods vehicles for HGVs/MGVs,

LGVs, three wheeled goods vehicles into arterial roads. In order to ensure supply of essential/perishable commodities/goods in the NCT of Delhi, permission for some vehicles during restricted hours i.e. No Entry Hours is necessary.

## 5 FINDINGS

The broad findings of the best practices worldwide and case studies as explained in the previous sections can be summarised as follows,

i. As economic activities in cities expand and city population grows, a substantial amount of freight traffic would be generated. The timely and smooth movement of such freight is crucial to the well-being of the people and the viability of the economic activities they undertake.
ii. However, with limited capacity of the transport system, it is essential that freight traffic and passenger traffic are so staggered as to make optimum use of the transport infrastructure.
iii. It is a time honored and tested practice to use off-peak passenger travel times to move freight.
iv. Many cities have earmarked late night hours for the movement of freight and restricted the entry of heavy vehicles into cities during day time.
v. Further, several cities have by-passes that enable through traffic to go around the city and not add to city traffic. These practices are sound and would be encouraged in all cities.
vi. For this purpose, cities would be encouraged to build by-passes, through innovative and viable public – private partnerships.
vii. Similarly, facilities for the parking of freight vehicles outside city limits, such as truck terminals, would also be encouraged through public-private partnerships.
viii. Proposals for such facilities would be considered under the SMART CITY plans
ix. Only 15-25% of total is commercial traffic, but takes up 20-40% of road space
x. Causes 20-40% of all CO2 emissions
xi. Freight already accounts for almost 40% share of total metropolitan vehicle travel in India
xii. Volume of urban freight will continue to grow as urbanization gathers pace, and people become more affluent
xiii. Indian cities need to prepare and plan for such growth – hence Bangalore is also in need of the same

## 6 INTERVENTION

To mitigate the issues pertaining to freight, the freight movement is ideally restricted to the orbital roads & the integrated freight terminals should ideally be located on the city's peripherals. The restrictions in the central areas could be in the form of banning the entry of HCVs completely and permitting only LCVs between 10 PM and 9 AM;

In this direction, Bengaluru Traffic Police issued prohibitory orders to HTVs or goods vehicles from entering Bengaluru City from the nine radial roads during 8.00 am – 11.00 am in the morning and 4.30 – 7.30 pm in the evening.

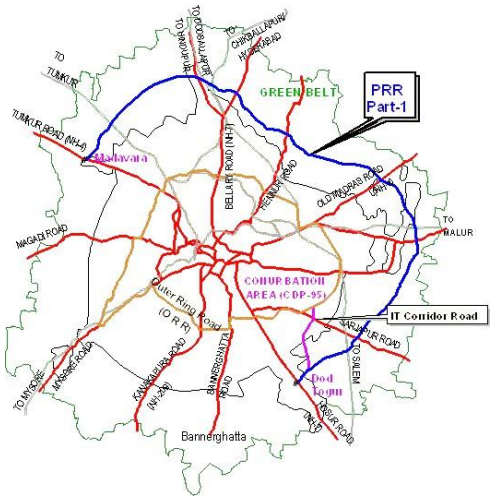


Figure 8. Map showing Nine Radial Roads of Bangalore

This move is aimed at optimally utilising the road space to accommodate home to work traffic rather than goods carrying heavy vehicles. The off peak hours are utilized for business trips made by freight carrying vehicles.

The legislation, -Section 115 of MVA, 1988 authorizes the State Governments to restrict movement of Motor Vehicles of any specified class/description in a specified area or on a specified road in the interest of public safety.

Vehicle Operating Costs (VOC) depends on factors such as,

- Horizontal curves
- Vertical alignment (steep grades)
- Guideway condition (e.g., for highways -> potholes)
- Congestion (as aspects that influence congestion)
- Guideway sections that involve deceleration/acceleration

Also, VOC depends on the vehicle class and size. Higher the size of the vehicle, higher the consumption of fuel and hence, higher the VOC. With newer technology vehicles, there will be higher fuel efficiency and hence lower VOC. Higher VOC accounts to increase on total Road User Cost which inturn affects the economy of the city. Road user cost includes both financial and non-financial impacts. Financial impacts include the travel time cost, vehicle operating cost and road accident costs. Non-financial impacts may include unwanted changes in the ecology and environment and increase in noise.

All this summarises the adoption of prohibition of freight movement (business trips) and allowance of light vehicles (home to office and back to home trips)

## 7 OUTCOME

The ban on heavy and medium freight carrying vehicles was implemented strictly at all the entry points to the CBD area, which were choke points, where the general traffic lost around 20-25 minutes just to cross the bottleneck points. After the restriction, the waiting times were reduced to 7-10 minutes.

Commuters have pointed out that the strategy of Bengaluru Traffic Police to prohibit Heavy Transport Vehicles in many areas of the city has helped with easing the flow of traffic. HTVs have been observed to pose risks to commuters as many of them drive at high speeds, and during peak hours, add to traffic congestion.

This enforcement measure is proving to be a successful short term solution to effective freight movement management.

| Sl # | | CORRIDOR | | Travel Time (in Minutes) | | PEAK HOUR |
|---|---|---|---|---|---|---|
| | LOCATION | FROM | TO | before | now | |
| 1 | Hebbal Flyover | Amruthalli Junction | Hebbal Flyover (Hebbal Police Stn) | 18 | 12 | Morning Peak |
| 2 | Mysore Road | Kengeri | City Market | 46 | 35 | Morning Peak |
| 3 | Richmond Road | Trinity Church (Richmond R | Richmond Circle | 21 | 11 | Morning Peak |
| 4 | Residency Road | Richmond Circle | Mayo Hall | 38 | 12 | Morning Peak |
| 5 | KR Puram | Benniganahalli Underpass | Battarahalli | 31 | 13 | Morning Peak |
| 6 | Bellary Road | HQTC (Mekhri Circle) | Esteem Mall | 22 | 15 | Evening Peak |
| 7 | Bangalore East | Kasthurinagar | Traffic Management Center | 66 | 36 | Morning Peak |
| 8 | Yeshwanthpur | Yeshwanthpur Railway Stati | Jayanagar 4th Block | 65 | 52 | Evening Peak |
| 9 | Outer Ring Road via Hebb | KR Puram | Kodigehalli | 97 | 70 | Evening Peak |

Table 2. Comparison of Travel Time before and after the intervention

## 8 CONCLUSION

It is suggested that in the new revised master plan being drafted for Bengaluru, new missing links to be identified to ensure that the Trucks can move without disturbing the city bound traffic. Additional Oribital Roads (Ring Roads) should also be planned to cater to the forecasted traffic demand of Bengaluru city. In this direction Satellite Town Ring Road and Peripheral Ring Road Projects which are under construction provide long term solutions to segregate the regional and urban traffic in the Bengaluru Metropolitan Region.

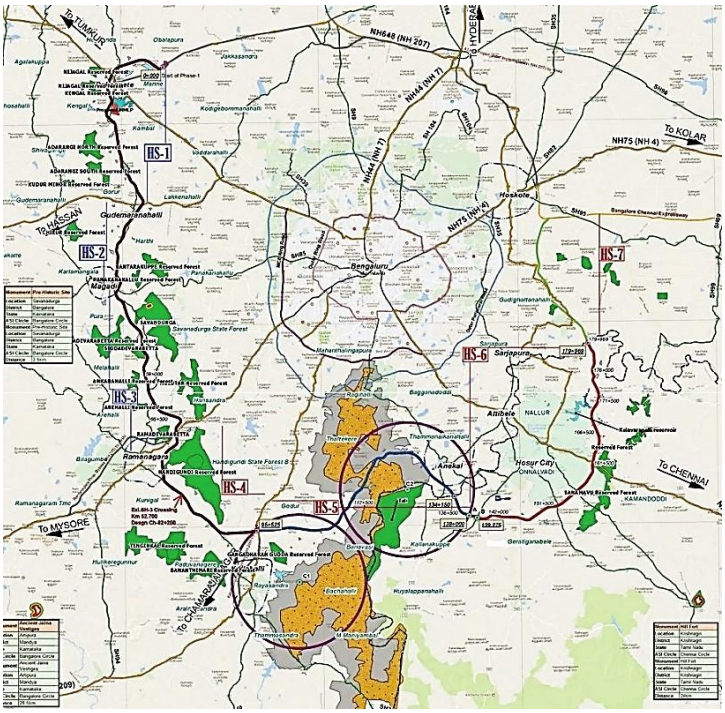


Figure 9. Map showing BMR with Peripheral Ring Road and Satellite Town Ring Road

Also, Bengaluru city should adopt a delivery access regulation based on a simple combination of the size and the age of delivery vehicles. Viz;

- A ban on large trucks, such as semi/double trailers
- Permitting only low-capacity vehicles in the city
- A ban on the oldest commercial vehicles is also relevant as this will curb pollution.

It is inevitable that Truck Terminals are located strategically along all the major corridors. The committee, through these recommendations and suggestions anticipate that there will be smoother and safer movement of traffic across Bangalore city, with reduced air and noise pollution and decreased traffic crashes due to involvement of trucks and other vehicles.

9 REFERENCE


[1] http://portal.flywheel.in/start/Mainsite/pdfdoc/CWGTrafficRestrictions.pdf
[2] http://siteresources.worldbank.org/EXTURBANTRANSPORT/Resources/341448-1269891107889/urban_freight.pdf
[3] Freight Master Plan - The City of Portland, Oregon-www.portlandoregon.gov/transportation/article/398176
[4] http://www.ops.fhwa.dot.gov/
[5] http://www.tfl.gov.uk
[6] http://english.seoul.go.kr/.../urban-planning
[7] https://data.gov.in/
[8] www.dfccil.gov.in/
[9] www.outlookindia.com/news/printitem.aspx?71310